REMARKS

STATUS OF CLAIMS

Claims 1-6 are pending.

Claims 1, 6, 7, 9, and 11 are amended. New claim 14 is added.

Thus, claims 1-14 remain pending for reconsideration, which is respectfully requested.

No new matter has been added in this Amendment. The foregoing rejections are hereby traversed.

SPECIFICATION OBJECTION AND REJECTION UNDER 35 USC 112, FIRST PARAGRAPH

The specification, page 4, line 11, is objected to because of a minor formality. Further, claims 7-10 are rejected under 35 U.S.C. §112, first paragraph, as based on a disclosure which is not enabling. In particular, the specification objection and the enablement rejection relates to the meaning of "inclination characteristic" and "maximum inclination characteristic."

(1) Regarding the specification rejection, the Applicant notes that in the previous Amendment, page 4, line 11, was amended to clarify the "inclination characteristic" as follows:

> According to the structures and characters of the present invention, mentioned above, by arranging the correction filter, the flatness of the sound pressure level can be maintained in the inclination characteristic (i.e., in the relation between the sound pressure and the sound frequency) even if the frequency varies, so that the sound around the entire periphery of the wide-directional loudspeaker system can approach ~~to~~ the actual sound.

The Examiner asserts that it remains unclear as to what part or type of the relationship between the sound pressure level and the frequency that use of such claim language is referring (page 2 of the final Office Action).

The Applicant asserts concerning the "inclination characteristic," that as stated from page 1, line 2, from the bottom to page 2, line 22, typically a high-frequency attenuation is not substantially observed on an axial line of a speaker as shown in FIG. A below. In other words, in frontal characteristics along the axial line, there is substantially no high-frequency attenuation.

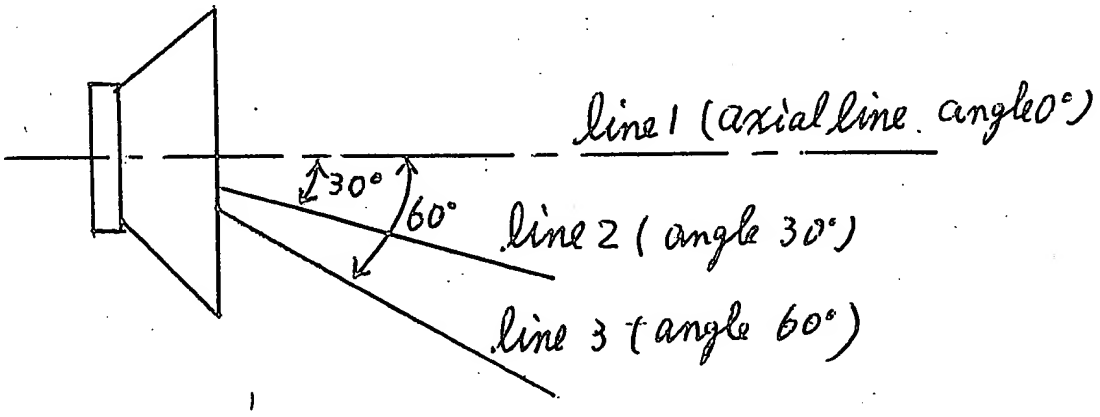


FIG. A

A) First, typically when high frequency attenuation for a single speaker unit occurs along a line other than the axial line, the sound pressure decreases with increasing sound frequency as shown in FIG. B. below. The average slope of the curve in FIG. B changes to increase with increasing the high-frequency attenuation.

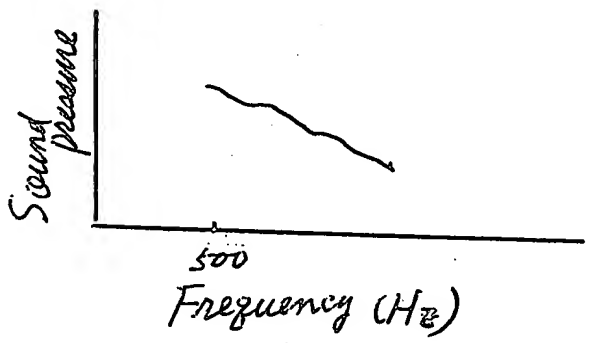


FIG. B

B) Second, as mentioned above, along the axial line 1 of the speaker unit, there is substantially no high-frequency attenuation. However, for example, if the angle of gradient is increased as shown in FIG. A, from axial line 1 (angle of gradient 0 degrees) to line 2 (angle of gradient 30 degrees) to line 3 (angle of gradient 60 degrees), the high frequency attenuation or the average slope of the sound pressure curve over the frequency range from about 500Hz to about 2000Hz increases with increase of the angle of gradient as shown in FIG. C below.

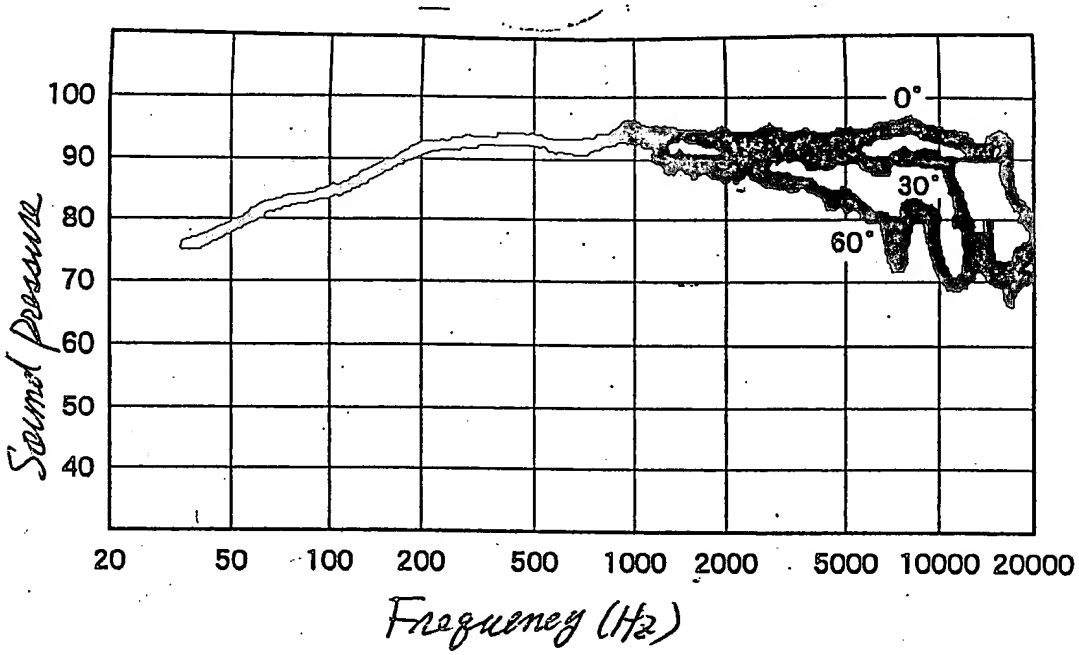


FIG. C

C) Therefore, concerning the "inclination characteristic" for a single speaker unit, it is characteristics of high-frequency attenuation along a line that inclines with a certain degree of angle from the axial line, with respect to the frontal characteristics along the axial line of the speaker unit, as shown in FIG. A above.

Therefore, the objection to the specification is hereby traversed, because it is clear from the specification on page 1, line 2 from the bottom, to page 2, line 22 (in particular, page 2, lines 21-22), that an "inclination characteristics" refers to characteristics of high-frequency attenuation along a line that inclines with a certain degree of angle from the axial line, such as lines 2 and 3 in the above FIG. A.

(2) Regarding the rejections of claims 7-10 under 35 U.S.C. §112, first and 2nd paragraphs, asserting that the recitation, "maximum inclination characteristic" is not enabled and is indefinite, the Applicant respectfully disagrees as follows:

DEPENDENT CLAIMS 7 AND 9

Concerning the "maximum inclination characteristic," it is expressly and clearly described and enabled at the paragraph bridging pages 7 and 8, and as shown in FIGS. 3, 4, and 5. The maximum inclination characteristic appears at a measured position S1 (see FIG. 3) separated by a specific distance from the apex between the adjacent two speakers 3 of the polyhedron body. And at the measured position S1, an average slope of a characteristic curve P1 as an inclination characteristic, which is plotted with sound pressure versus frequencies, without a correction filter, becomes maximum over the frequency range from about 500Hz to about 20KHz (see FIG. 5), because the sound pressure maximally attenuates in relationship with frequency as shown in FIG. 5. In FIG. 4, when a correction filter 4 of the present invention is used, the characteristic curve P2 as an inclination characteristic can be maintained flat, or the average slope of the curve P2 becomes substantially flat. In other words, the present invention flattens the "sound pressures at a position existing on a line extending straight from a center of the polyhedron toward an outside of the polyhedron via an ~~at~~ apex ~~positions~~position of the adjacent two speakers, wherein at the position an average attenuation in sound pressure versus the increasing sound frequencies from about 500Hz and greater is maximum without the correction filter" (amended claim 1). Support for the claim amendments is found in the bridging paragraph of pages 7 and 8, and FIGS. 3, 4, and 5 showing the inclination characteristics of curves P2 and P1 at an apex line point S1 when measuring increasing frequency versus sound pressure, in which the sound pressure attenuates (decreases) as the sound frequency increases.

In other words, as shown in FIG. 3, in the present invention, a position S1 having the maximum inclination characteristic is a specific position along a line extending from the center of the polyhedron toward an outside of the polyhedron via (through) an apex, which exists between the axial lines P of the adjacent tow speakers 3. As shown in FIG. 5, at the position S1 having the maximum inclination characteristic, the average slope of a characteristic curve P1 as an inclination characteristic becomes maximum when a correction filter is not used. Dependent claims 7 and 9 are clearly definite and enabled by reciting, "the sound pressure is increased according to the position having the maximum sound pressure attenuation characteristic in a relationship between the increasing sound frequency of about 500Hz and

about 20kHz, without the correction filter" (claim 7 as amended). And support for dependent claim 7 and 9 can be found, for example, in the bridging paragraph between pages 7 and 8, and FIGS, 3, 4 and 5.

DEPENDENT CLAIMS 8 and 10

Regarding the dependent claims 8 and 10 not being enabled, it is respectfully asserted that one skilled in the art can maintain "characteristics of the speakers are set to maintain the flatness of the sound pressures at a position outside each speaker along an axial line of each speaker without the correction filter," because typically speakers maintain flatness of the sound pressure at high frequencies (reducing higher frequency attenuation) on the frontal axial line of the speaker (line 1 in FIG. A). See, pages 2 and 9, and FIG. 7, position S2 and line P, in the present Application.

REJECTIONS UNDER 35 U.S.C. §103:

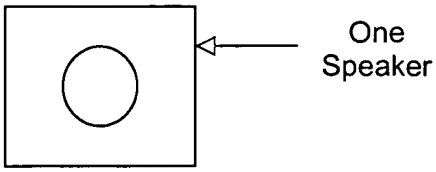
Claims 1-2, 6 and 11 are rejected under 35 U.S.C. §103(a) as being unpatentable over Glassco (U.S. Patent 4,673,057) in view of Davis (U.S. Patent 4,503,553).

Claims 3-5 and 12-13 are rejected under 35 U.S.C. §103(a) as being unpatentable over Glassco in view of Davis, as applied above, and further in view of well known prior art (MPEP 2144.03).

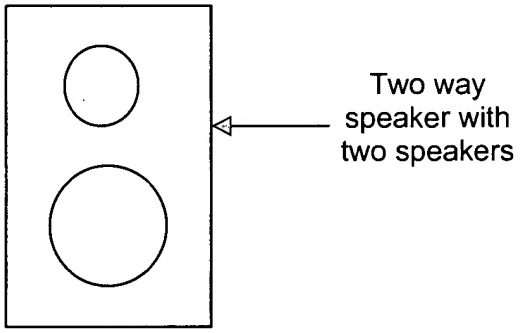
Claims 7-10 are rejected under 35 U.S.C. §103(a) as being unpatentable over Glassco in view of Davis, as applied above, and further in view of Kito et al. (U.S. Patent 4,146,756).

To clarify the recitations of the claims and the patentably distinguishing features of the present invention, the Applicant would like to explain a "single speaker system," a "two way speaker system," etc. as follows:

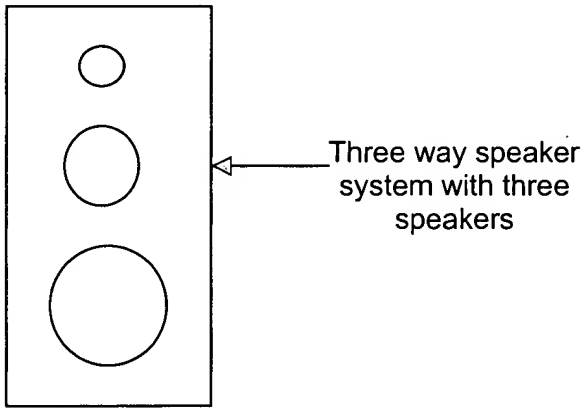
1) a single speaker system includes one full range speaker unit in one speaker box, and sound is emitted from the system.



2) A two way speaker system as shown in FIGS. 1, 2, and 7 of Davis, include a woofer (a speaker unit exclusively used for low frequency) and tweeter (a speaker unit exlusively used for high frequency) are provided in one speaker box. An exclusive drive circuit is set up for each woofer and tweeter so that full range of frequencies can be emitted from the system.



3) A three way speaker system includes an additional squawker (a speaker unit exclusively used for mid-range frequency) in the two way speaker system.



A major advantage of the present invention's polyhedron shape speaker system using only full range speaker units is that all sound frequency ranges from low-range to mid-range to high-range frequency can be generated from one place or one speaker system or one sounding body, that is one speaker box. Therefore, according to the present invention, a polyhedron type loud speaker having simple-point-sound source and omnidirectional characteristics can be constructed in a simple manner by using a plurality full range speaker units, for example, a single-cone full range speaker unit, and only one correction circuit is used for correcting characteristics of each speaker unit.

In contrast to a one-way speaker system, in a multi-way speaker system having a woofer, squawker, and tweeter, a correction circuit should be provided for each woofer, squawker, and tweeter, respectively, which can be complicated. In addition, each woofer, squawker, and tweeter has a different size and mass of diaphragm, and therefore each has a different shape and different sound quality. Davis discloses a multi-three-way speaker system as shown in FIGS. 7-10 and in column 7, line 54 to column 8, line 36. The Examiner suggests that Davis can be applied to Glassco to provide a multi-three-way polyhedron speaker system. However, for example, to provide a three-way dodecahedron type polyhedron speaker system, 36 3-way speakers should be used. Each 3-way speaker should have at least one correction circuit, resulting in a large speaker system size. Even if such a 36 3-way speaker system could be constructed, such system might emit disharmonized sound, unable to provide a sound field, because of the large number of 3-way speakers. Therefore, one having ordinary skill in the art, would not apply Davis speaker system design to a polyhedron type speaker system, which undermines the Examiner's alleged motivation to combine Davis with Glassco's polyhedron speaker system.

Accordingly, a polyhedron speaker system of the present invention using only a plurality of single cone full range speaker units has a simple structure that can emit a coordinated (harmonized) sound quality by providing "a correction filter operatively connected to the speakers and increasing sound pressures in relation to increasing sound frequencies to flatten the sound pressures at a position existing on a line extending straight from a center of the polyhedron toward an outside of the polyhedron via an ~~at~~ apex ~~positions~~position of the adjacent two speakers, wherein at the position an average attenuation in sound pressure versus the increasing sound frequencies from about 500Hz and greater is maximum without the correction filter." If one combined Glassco and Davis to provide a speaker system using multi-way speaker units (if it could be built), it would have a complex structure by using multiple correction circuits for each multi-way speaker unit, and the Applicant asserts that such a multi-way polyhedron speaker system likely has a disharmonized sound. In contrast to an alleged combined Glassco and Davis speaker system, the present invention provides one correction filter to correct characteristics of a speaker unit.

More particularly, the Examiner on page 5, line 8 from the bottom, asserts that Davis discloses circuitry for obtaining a flat frequency response in the on-axis as well as off-axis directions (Davis column 8, lines 29-68). In particular, the Examiner asserts that "the flat

response is obtained by adjusting the amplitude and phase of each output signal based as a function of frequency (Davis, column 8, lines 57-69)." However, both Glassco and Davis disclose different techniques than the present claimed invention to improve the quality of sound from a loud speaker having a polyhedron shape. The independent claims 1, 6 and 11 are amended to further emphasize the patentably distinguishing features of the present invention. The present invention aims to provide a good quality sound in a polyhedron shape speaker, but in contrast to Glassco and Davis the present invention adopts a more simple and innovative structure by providing, as recited in amended claim 1:

> a correction filter operatively connected to the speakers and increasing sound pressures in relation to increasing sound frequencies to flatten the sound pressures at a position existing on a line extending straight from a center of the polyhedron toward an outside of the polyhedron via an ~~at~~ apex ~~positions~~position of the adjacent two speakers, wherein at the position an average attenuation in sound pressure versus the increasing sound frequencies from about 500Hz and greater is maximum without the correction filter.

Therefore, the correction circuit of the present invention is used for correcting the inclination characteristics at the apex positions with maximal inclination characteristic (i.e., characteristics of high-frequency attenuation along a line that inclines with a certain degree of angle from the axial line, with respect to the frontal characteristics along the axial line of the speaker unit, as shown in FIG. A above at the apex positions), so that flatness of the sound pressure can be secured all around the polyhedron. Or in other words, the present invention flattens the "sound pressures at a position existing on a line extending straight from a center of the polyhedron toward an outside of the polyhedron via an ~~at~~ apex ~~positions~~position of the adjacent two speakers, wherein at the position an average attenuation in sound pressure versus the increasing sound frequencies from about 500Hz and greater is maximum without the correction filter" (amended claim 1). Support for the claim amendments is found in the bridging paragraph of pages 7 and 8, and FIGS. 3, 4, and 5 showing the inclination characteristics of curves P2 and P1 when sound frequency increases versus sound pressure, in which the sound pressure attenuates (decreases) as the sound frequency increases.

Even if one combined, Glassco, Davis and Kito, the combined speaker system of the prior art would disclose a multi-way polyhedron speaker system that not only differs from the present invention's full range polyhedron speaker system, but would likely output disharmonized sound and structurally not practical. Therefore, such a combined speaker system of the prior art does not disclose or suggest the present invention's polyhedron type speaker system with

full range speaker units and a correction filter to correct sound pressure at the specific position on a line extending straight from a center of the polyhedron via an apex of the adjacent two speakers.

The Examiner also relies on Kito to reject claims 7-10. The Examiner asserts that "Kito discloses a loudspeaker with an improved output frequency range" and "the resulting relationship between the output sound pressure levels and the output frequencies is shown in Figure 4." Fig. 4 of Kito shows flatness in relationship between sound pressure and sound frequency. However, Kito relates to a single speaker unit (or a concentric section (full range unit) speaker). And Kito uses a lower and upper section of a diaphragm to achieve the flatness. In addition, the LCR drawn in FIGS. 2 and 3 of Kito, is an equivalent circuit of an electroacoustic transducer, but not an electronic circuit of the present invention. Therefore, in contrast to Kito, the frequency characteristics of FIG. 4 of the present invention relates to an area all around the polyhedron type speaker to "flatten the sound pressures at a position existing on a line extending straight from a center of the polyhedron toward an outside of the polyhedron via an ~~at~~ apex ~~positions~~position of the adjacent two speakers, wherein at the position an average attenuation in sound pressure versus the increasing sound frequencies from about 500Hz and greater is maximum without the correction filter.

There is no motivation or suggestion to combine Kito with Glassco or Davis, because Kito uses a lower and upper section of a diaphragm of a full range unit speaker unit to achieve the flatness in relationship between sound pressure and sound frequency, and is not directed to achieve the present invention's sound pressure flatness at "a specific position existing on a line extending straight from a center of the polyhedron speaker toward an outside of the polyhedron via an apex of the adjacent two speakers."

The Examiner's motivation in page 6 of the final Office Action is not appropriate, and the Applicant asserts that is no motivation or suggestion in Glassco to be combined with Davis or Kito, because Davis uses three-way speaker units. In other words, there is no suggestion or motivation in Glassco to be combined with Davis and/or Kito, because Glassco is only relied upon for the shape of the present invention's speaker system (i.e., a polyhedron shape), and Glassco uses one-way speakers, so that there would be no motivation to combine Davis' circuit for a three-way type speaker system into Glassco's one-way polyhedron speaker system. And Kito's achieves sound pressure flatness in one full-range unit speaker unit (Kito, Abstract), which would not be applied to the present invention's multi-one-way polyhedron speaker system to flatten attenuating frequencies at apex positions. None of the relied upon reference, either

alone or combined, address the following: to flatten the sound pressures at a position existing on a line extending straight from a center of the polyhedron toward an outside of the polyhedron via ~~at~~ apex positions of the adjacent two speakers, wherein at the position an average attenuation in sound pressure versus the sound frequencies increasing from about 500Hz and greater is maximum without the correction filter. In other words, Davis does not relate to addressing sound attenuation at the apex positions and even Davis was modified into a polyhedron, it would likely not provide harmonized sound.

Finally, the Examiner asserts that Glassco discloses a dodecahedron (paragraph bridging pages 4-5 of the final Office Action), which reads on the present invention's "loudspeaker body having a polyhedron shape." However, the Applicant disagrees with Glassco, and emphasizes that a dodecahedron shape is only one example of a polyhedron shape, and hence the claimed invention is not limited to the dodecahedron shape only (see paragraphs from page 13, line 2, from the bottom, to the end of page 14).

DEPENDENT CLAIM 5

Regarding dependent claim 5, the Examiner in page 9, line 12 of the final Office Action, asserts that Davis discloses the present invention's "said correction filter includes at least two resisters and two capacitors which operatively connected." However, the correction filter of Davis is made up of an LCR circuit or an active amplifying circuit, which differs from a "correction filter includes at least two resisters and two capacitors which operatively connected." Further, Davis provides a plurality of correction circuits for each woofer unit, squawker unit, and tweeter unit independently in each three-way speaker of the plurality of the three-way speakers. On the contrary, the correction filter of the present invention is used for correcting a single cone full range speak unit. Although, both Davis and the present invention provide electronic circuits, the Applicant asserts that there is a substantial difference between the multi-way system and the single way system. Hence, configuration of the circuit or circuitry of the present invention as recited in dependent claim 5 differs from Davis.

CONCLUSION

In view of the claim amendments and the remarks, withdrawal of the rejections and allowance of claims is requested.

Finally, if there are any formal matters remaining after this response, the Examiner is requested to telephone the undersigned to attend to these matters.

Respectfully submitted,
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